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# **WESTERN SPRUCE BUDWORM EVALUATION IN WASHINGTON - 1984**

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# ENTOMOLOGICAL EVALUATION OF THE WESTERN SPRUCE BUDWORM IN WASHINGTON-1984

## INTRODUCTION

The last large scale outbreak of the western spruce budworm occurred in eastern Washington during the years 1972 to 1977. Suppression projects were conducted during the peak outbreak years of 1976 and 1977 when over a million acres of defoliation were mapped annually. The defoliation trend has generally been downward since 1977, going from a high of 378,070 acres (153,003 hectares) in 1980 to a low of 9,720 acres (3934 hectares) in 1982. Since 1982 the defoliation trend has been upward; 37,850 acres (15,318 hectares) in 1983, and 57,214 acres (23,154 hectares) in 1984 (see Table 1).

The increasing defoliation trend triggered a western spruce budworm egg mass and defoliation survey in the fall of 1984. This report gives the results of the survey.

## MATERIALS AND METHODS

A total of 138 egg mass plots were sampled by Department of Natural Resources (DNR) and US Forest Service crews in September, October and November in the 1984 outbreak areas. Plot distribution by area and land ownership are shown in Table 3.

### DNR Plots

Plots sampled by DNR crews were established at a density of one per square mile in accessible areas in and adjacent to defoliated areas mapped by the aerial survey in 1984. The plot consisted of a cluster of 6 host trees (dominant or codominant Douglas-fir or true fir) of sufficient height to allow sampling at midcrown with hand held pole pruners.

One 30-inch branch was removed from each sample tree at mid-crown and placed in a paper bag (labeled with tree and plot numbers) and transported to the laboratory.

Branch foliage area (in square inches) was determined in the laboratory by measuring branch length and width and dividing by 2. The needles were then examined on both sides and egg masses were removed and placed in small petri dishes (one per branch). An entomologist examined the egg masses under a microscope and classified them as old or new, ie. , eggs deposited in 1984 and those deposited prior to 1984. Egg mass densities were calculated for the plot by taking

the total number of new egg masses and dividing by the total foliage area as follows:

$$\text{Egg Masses/1,000 Sq. In.} = \frac{(\text{no. of egg masses}) \times 1,000}{\text{sq. in. foliage}}$$

Egg mass density was then used to provide predictions of the defoliation to be expected in 1985 (Carolin and Coulter, 1972)<sup>1</sup>. The defoliation classes used were:

<u>New Egg Masses/Meter Square</u>	<u>Predicted Defoliation</u>	
	<u>Class</u>	<u>Percent</u>
0.0 - 2.0	Very Light	0 - 15
2.1 - 5.4	Light	16 - 25
5.5 - 13.8	Moderate	26 - 50
13.9 - 17.4	Heavy	51 - 90
27.5 +	Very Heavy	91 - 100

A weighted average for each area sampled was calculated from plot averages as follows:

*Defoliation classes were ranked on a scale of 0 to 1. Weighted values were obtained by multiplying the number of plots in a defoliation class by its assigned value. The weighted values were then summed to determine the area total. The area total was divided by the total number of plots to determine the weighted average.*

*Example: Weighted average for the Mount Hull area.*

<i>Defoliation Class</i>	<i>Number of Plots</i>	<i>Ranking</i>	<i>Weighted</i>
VL	6	0.2	(6*0.2) = 1.2
L	4	0.4	(4*0.4) = 1.6
M	10	0.6	(10*0.6) = 6.0
H	1	0.8	(1*0.8) = 0.8
VH	0	1.0	(0*1.0) = 0.0
Total =	21		9.6

<sup>1</sup> 1972. Sampling populations of western budworm and predicting defoliation in eastern Oregon. USDA Forest Service, Pacific Northwest Forest and Range Exp. Sta., Res. Pap. PNW-149, 33p.

*Weighted average =  $9.6/21 = 0.46$ . The weighted average falls between the light and medium defoliation classes therefore the Mount Hull area represented by the sample plots can be expected to suffer light to medium defoliation in 1985.*

An ocular estimation of new defoliation (foliage removed during 1984) and old defoliation (cumulative defoliation to 1983) was made when the egg mass sample branches were collected and plots were placed in the following defoliation classes:

<u>Defoliation Class</u>	<u>Percent Defoliation</u>
Absent (absent)	No Defoliation
L (light)	1 - 25
M (moderate)	26 - 50
H (heavy)	51-100

#### FOREST SERVICE PLOTS

At each Forest Service plot, a pole pruner was used to clip one branch from each of 20 host trees of similar species, either Douglas-fir or true fir. Sampling strata was at midcrown of trees between 7 and 14 meters (22 to 43 feet) or lower crowns of trees taller than 14 meters. Clipped branches were measured and trimmed to 45 cm (17.7 in.) and all branches from the same tree were bagged together, boxed, and transported for examination to the budworm egg mass survey headquarters at Prineville, Oregon. Here branches from each plot were examined one-by-one for egg masses until a decision on population level could be made based on the sequential count method developed by Srivastava and Campbell.<sup>2</sup>

#### **RESULTS**

The Conconully-Windy Hill Unit suffered light to moderate defoliation with 27 plots showing cumulative defoliation of up to 25% in 1983, and 12 plots had moderate defoliation (up to 50%). In 1984, 16 plots had up to 25% defoliation, 12 had moderate, and eight plots suffered heavy defoliation.

Mount Hull Unit had 15 plots with cumulative defoliation of up to 25% in 1983, 4 plots with moderate, and two plots had heavy defoliation. Fifteen plots were lightly defoliated in 1984, and 6 plots suffered moderate defoliation.

<sup>2</sup> Srivastava, N., and R. N. Campbell. 1982. Sequential classification and count plans for populations of western spruce budworm: egg masses, instar IV and pupae. Unpublished manuscript on file at Forestry Sciences Laboratory, Corvallis, OR 97331, 28 p. (typed).

The Sinlahekin-Palmer Mountain Unit was lightly defoliated prior to 1984, with only 8 plots showing moderate defoliation. The trend continued into 1984; 29 plots had light defoliation, 7 moderate, and 2 with heavy defoliation.

The Rimrock Lake Unit is a new area; defoliation was mapped for the first time in 1984. Thirty-two plots were lightly defoliated in 1983, and only 3 had moderate defoliation. Twenty-seven plots had light defoliation, 6 were moderately defoliated, and two suffered heavy defoliation in 1984.

Egg mass samples indicate that light to moderate defoliation will continue in 1985 on all Units (see Table 2).

## **RECOMMENDATIONS**

An economic analysis is recommended to determine if resource values at risk are high enough to justify an Environmental Impact Statement for determining the appropriate management decision.

TABLE 1. ACREAGES OF WSBW DEFOLIATION DETECTED IN WASHINGTON DURING 1983 AND 1984.

<u>AREA</u>	<u>YEAR</u>	
	<u>1983</u>	<u>1984</u>
OKANOGAN NF		
Tonasket RD	3,340	12,542
State Lands	34,510 <sup>3</sup>	19,382
Private Lands		13,460
TOTAL	37,850	45,384
WENATCHEE NF		
Cle Elum RD	00	180
Naches RD	00	11,510
State & Private Lands	00	140
TOTAL	00	11,830
GRAND TOTAL	37,850	57,214

TABLE 2. DEFOLIATION PREDICTED FOR OUTBREAK AREAS IN 1985

<u>AREA</u>	<u>DEFOLIATION CLASS</u>					<u>WEIGHTED AVERAGE</u>	<u>PREDICTED DEFOLIATION</u>
	VL	L	M	H	VH		
CONCONULLY-WINDY HILL	10	8	13	5	1	0.48	LIGHT TO MODERATE
MOUNT HULL	6	4	10	1	0	0.46	LIGHT TO MODERATE
RIMROCK LAKE	12	8	7	5	4	0.49	LIGHT TO MODERATE
SINLAHEKIN-PALMER MTN.	17	6	10	4	1	0.42	LIGHT

<sup>3</sup> Includes both State and Private Lands.

TABLE 3. PLOT DISTRIBUTION BY AREA AND LAND OWNERSHIP

CONCONULLY-WINDY HILL UNIT

<u>LANDOWNER</u>	<u>ACRES</u>	<u>VL</u>	<u>L</u>	<u>M</u>	<u>H</u>	<u>VH</u>	<u>TOTAL</u>
Federal	7,757	3	4	5	1	1	14
State	3,983	3	3	2	3	0	11
Private	5,921	4	1	6	1	0	12
TOTAL	17,616	10	8	13	5	1	37

MOUNT HULL UNIT

<u>LANDOWNER</u>	<u>ACRES</u>	<u>VL</u>	<u>L</u>	<u>M</u>	<u>H</u>	<u>VH</u>	<u>TOTAL</u>
Federal	3,295	3	4	6	1	0	14
State	78	1	0	0	0	0	1
Private	1,607	2	0	5	1	0	8
TOTAL	17,616	10	8	12	5	1	23

SINLAHEKIN-PALMER MOUNTAIN UNIT

<u>LANDOWNER</u>	<u>ACRES</u>	<u>VL</u>	<u>L</u>	<u>M</u>	<u>H</u>	<u>VH</u>	<u>TOTAL</u>
Federal	1,526	1	0	0	0	0	1
State	15,321	6	5	4	3	1	19
Private	5,932	10	3	4	1	0	18
TOTAL	22,779	17	8	8	4	1	38

RIMROCK LAKE UNIT

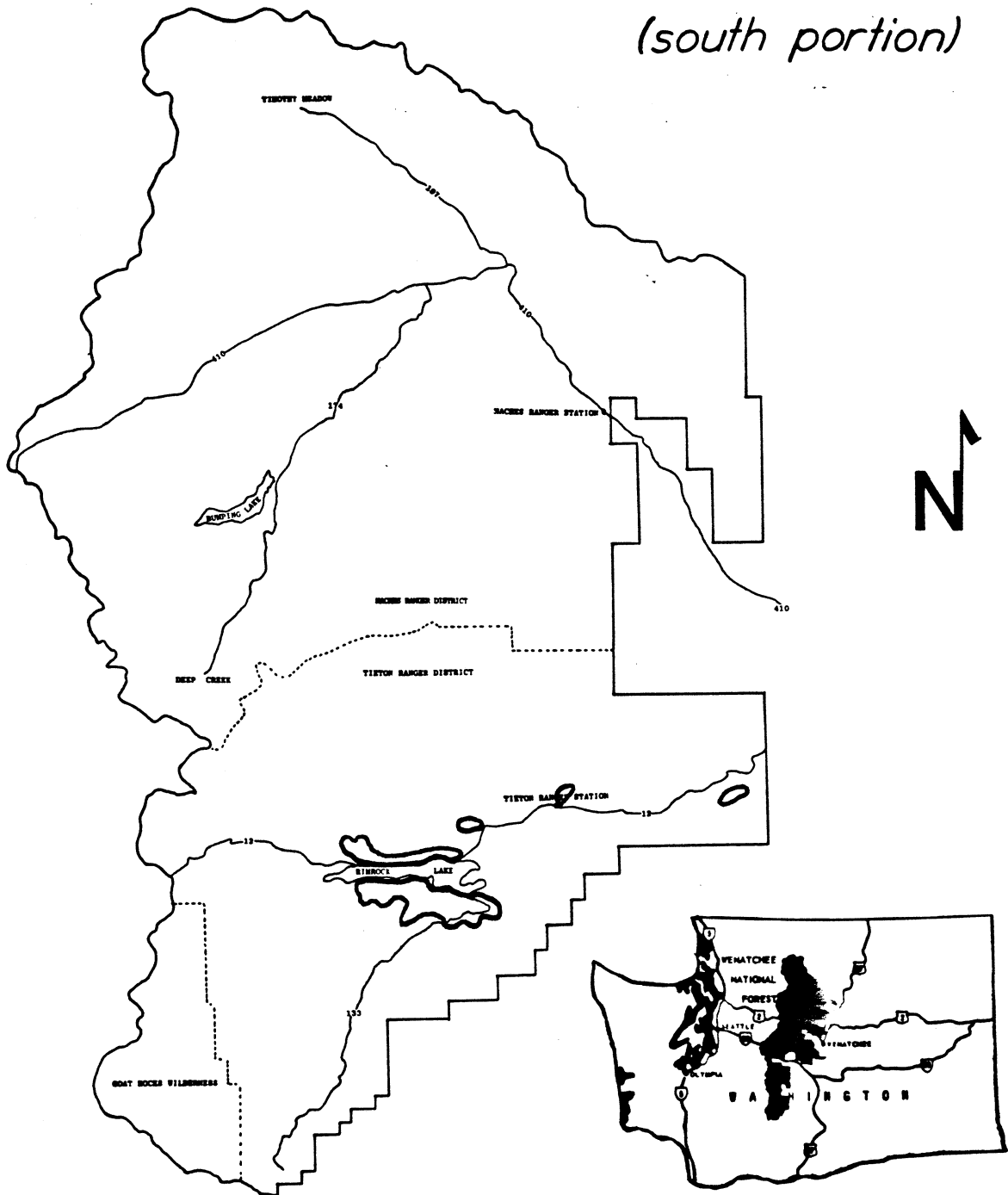
<u>LANDOWNER</u>	<u>ACRES</u>	<u>VL</u>	<u>L</u>	<u>M</u>	<u>H</u>	<u>VH</u>	<u>TOTAL</u>
Federal	11,670	7	6	6	7	4	30
State & Private	140	5	4	1	0	0	10
TOTAL	11,810	12	10	7	7	4	40





# WENATCHEE NATIONAL FOREST

*(south portion)*



Western Spruce Budworm  
Defoliation - 1984